3. Treated municipal wastewater is also discharged at Discharge Point 002 to the Arboretum Waterway (North Fork of Putah Creek), a water of the United States and a tributary to the Sacramento River at a point Latitude 38°, 31', 56" N and longitude 121°, 45', 50.6" W.

4. Putah Creek originally flowed through the City of Davis where the University is located. To prevent flooding, the City created the South Fork of Putah Creek and damming what is now known as the Arboretum Waterway (North Fork of Putah Creek). The Arboretum Waterway is located on the University of California, Davis campus and used as a storm water retention basin. During dry weather, the arboretum water becomes stagnant and fills with algae. The Arboretum Waterway currently discharges into the South Fork of Putah Creek for storm water management purposes.

   The previous Order (Waste Discharge Requirements Order No. R5-2003-003, Amendment No. 1) recognized that discharge of Arboretum Waterway flow to the South Fork of Putah Creek may require an NPDES permit. The previous NPDES permit authorizes a major discharge of 2.7 million gallons per day (mgd) to the receiving waters. A 20 October 2006 letter from Mr. Ken Landau, Regional Water Board Assistant Executive Officer, to the Discharger, clarifies that the Discharger is authorized to discharge tertiary-treated effluent to the North Fork of Putah Creek (also referred to as the Arboretum Waterway) in accordance with effluent limitations in the existing NPDES Permit.

   The discharge of tertiary-treated effluent into the Arboretum Water way provides a beneficial use of freshening up the otherwise stagnant waterbody, however, it is a surface water discharge, thus losing the label "reclaimed water" as the discharge enters the Arboretum Waterway. The removal of water reclamation requirements does no alter the tertiary Title 22-level treatment requirements. The regulation of the downstream discharge from the Arboretum Waterway to the South Fork of Putah Creek, which includes stormwater, is outside the scope of the NPDES Order and should be regulated by the NPDES Stormwater Program.

C. Summary of Existing Requirements and Self-Monitoring Report (SMR) Data

Effluent limitations for discharge to Putah Creek contained in the existing Order for discharges from Discharge Point No. 001 and representative monitoring data from the term of the previous Order are as follows:

Table F-2. Historic Effluent Limitations and Monitoring Data

Parameter	Units	Effluent Limitation			Monitoring Data (From January 2003 – To May 2007)		
		Average Monthly	Average Weekly	Maximum Daily	Highest Average Monthly Discharge	Highest Average Weekly Discharge	Highest Daily Discharge
Flow	mgd	--	--	2.7	2.2	--	2.9
BOD[1]	mg/l	10[2]	15[2]	25[2]	2.5	--	5.3
Total Suspended Solids	mg/l	10[2]	15[2]	25[2]	2.4	--	4.4
pH	SU	--	--	6.5-8.5[9]	Reported values range from 6.5 – 8.57		
Total Coliform Organisms	MPN/100 ml	--	2.2[3]	23	<82	--	>1600
Settleable Solids	ml/l	--	--	0.1	<0.1	--	<0.1
Turbidity[5]	NTU	--	2[4]	5	1.6	--	6.7
Total Residual Chlorine	mg/l	--	0.01[6]	0.02[7]	--	--	--
Ammonia (as N)	mg/l	Attachment	--	Attachment[7]	0.77	--	2.6
Nitrate + Nitrite (as N)	mg/l	10	--	--	10.5	--	11.5
Aluminum	µg/l	--	87[6]	750[7]	105	--	252
Cyanide	µg/l	--	5.2[6]	22[7]	6.1	--	6.1
Copper	µg/l	--	Attachment[6]	--	41[10]	--	71[10]
Dichloromethane	µg/l	4.7	--	--	<2	--	<2
Dioxin/Furans	pg/l	0.014	--	--	--	--	--
Iron	µg/l	300	--	--	145	--	145
Electrical Conductivity	µmhos/cm	900	--	2,200	1396	--	1,679
Lead[8]	µg/l	--	Attachment[6]	--	<2.5	--	<2.5

[1] 5-day, 20°C biochemical oxygen demand.
[2] To be ascertained by a 24-hour composite.
[3] 7-day median.
[4] Daily average.
[5] The turbidity shall not exceed 5 NTU more than 5 percent of the time within a 24-hour period. At no time shall the turbidity exceed 10 NTU.
[6] 4-day average.
[7] 1-Hour average.
[8] Limitation from 30 December 2007 forward.
[9] The discharge shall not have a pH less than 6.5 nor greater than 8.5.
[10] Data from August 2004-May 2007.

D. Compliance Summary

From January 2001 to April 2008 there were a total of 82 violations subject to mandatory minimum penalties (MMPs) for discharge exceedances of aluminum, coliform, copper, cyanide, EC, pH, total suspended solids, and turbidity.

E. Planned Changes

The treatment plant has just finished its first phase of expansion. There are no planned changes. The next phase of expansion will occur during the next permit cycle.

III. APPLICABLE PLANS, POLICIES, AND REGULATIONS

The requirements contained in this Order are based on the applicable plans, policies, and regulations identified in section II of the Limitations and Discharge Requirements (Findings). This section provides supplemental information, where appropriate, for the plans, policies, and regulations relevant to the discharge.

A. Legal Authority

See Limitations and Discharge Requirements - Findings, Section II.C.

B. California Environmental Quality Act (CEQA)

See Limitations and Discharge Requirements - Findings, Section II.E.

C. State and Federal Regulations, Policies, and Plans

1. **Water Quality Control Plans**. The Regional Water Board adopted a *Water Quality Control Plan, Fourth Edition (Revised August 2006), for the Sacramento and San Joaquin River Basins* (Basin Plan) that designates beneficial uses, establishes water quality objectives, and contains implementation programs and policies to achieve those objectives for all waters addressed through the plan. In addition, State Water Board Resolution No. 88-63 requires that, with certain exceptions, the Regional Water Board assign the municipal and domestic supply use to water bodies that do not have beneficial uses listed in the Basin Plan. The beneficial uses of Putah Creek downstream of the discharge are municipal and domestic supply (MUN), agricultural irrigation and stock watering (AGR), water contact recreation (REC-1), non-contact water recreation (REC-2), warm freshwater aquatic habitat (WARM), cold freshwater aquatic habitat (COLD), warm spawning habitat (SPWN), and wildlife habitat (WILD).

   The Basin Plan on page II-1.00 states: "*Protection and enhancement of existing and potential beneficial uses are primary goals of water quality planning...*" and with respect to disposal of wastewaters states that "*...disposal of wastewaters is [not] a prohibited use of waters of the State; it is merely a use which cannot be satisfied to the detriment of beneficial uses.*"

   The federal CWA section 101(a)(2), states: "*it is the national goal that wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife, and for recreation in and on the water be achieved by July 1, 1983.*" Federal Regulations, developed to implement the requirements of the CWA, create a rebuttable presumption that all waters be designated as fishable and swimmable. Federal Regulations, 40 CFR sections 131.2 and 131.10, require that all waters of the State regulated to protect the beneficial uses of public water supply, protection and propagation of fish, shell fish and wildlife, recreation in and on the water, agricultural, industrial and other purposes including navigation. Section 131.3(e), 40 CFR, defines existing beneficial

uses as those uses actually attained after November 28, 1975, whether or not they are included in the water quality standards. Federal Regulation, 40 CFR section 131.10 requires that uses be obtained by implementing effluent limitations, requires that all downstream uses be protected and states that in no case shall a state adopt waste transport or waste assimilation as a beneficial use for any waters of the United States.

This Order contains Effluent Limitations requiring a tertiary level of treatment, or equivalent, which is necessary to protect the beneficial uses of the receiving water. The Regional Water Board has considered the factors listed in CWC section 13241 in establishing these requirements, as discussed in more detail in the Fact Sheet, Attachment F, IV.B.2.

Putah Creek originally flowed through the City of Davis where the University is located. To prevent flooding, the City created South Fork Putah Creek and damming what is now known as the North Fork of Putah Creek (Arboretum Waterway). The Arboretum Waterway is a water of the United States and is located on the campus and used as a storm water retention basin and recreational impoundment. During dry weather, the arboretum water becomes stagnant and fills with algae. The Arboretum Waterway currently discharges into the South Fork of Putah Creek for storm water management purposes.

2. **Antidegradation Policy.** Section 131.12 requires that the state water quality standards include an antidegradation policy consistent with the federal policy. The State Water Board established California's antidegradation policy in State Water Board Resolution No. 68-16. Resolution No. 68-16 incorporates the federal antidegradation policy where the federal policy applies under federal law. Resolution No. 68-16 requires that existing water quality be maintained unless degradation is justified based on specific findings. The Regional Water Board's Basin Plan implements, and incorporates by reference, both the State and federal antidegradation policies. As discussed in detail in Section IV.D.4. of this Fact Sheet, the Discharger conducted an antidegradation analysis for the proposed increase in regulated discharge that is consistent with the antidegradation provisions of 40 CFR section 131.12 and State Water Board Resolution 68-16, and the Regional Water Board finds that allowing an increased regulated discharge provides a social and economical benefit to the people of the State.

3. **Anti-Backsliding Requirements.** Sections 402(o)(2) and 303(d)(4) of the CWA and federal regulations at title 40, Code of Federal Regulations section 122.44(l) prohibit backsliding in NPDES permits. These anti-backsliding provisions require that effluent limitations in a reissued permit must be as stringent as those in the previous permit, with some exceptions in which limitations may be relaxed. Compliance with the Anti-Backsliding requirements is discussed in Section IV.D.3.

4. ***Emergency Planning and Community Right to Know Act.*** Section 13263.6(a), California Water Code, requires that "*the Regional Water Board shall prescribe effluent limitations as part of the waste discharge requirements of a POTW for all*

substances that the most recent toxic chemical release data reported to the state emergency response commission pursuant to Section 313 of the Emergency Planning and Community Right to Know Act of 1986 (42 U.S.C. Sec. 11023) (EPCRKA) indicate as discharged into the POTW, for which the State Water Board or the Regional Water Board has established numeric water quality objectives, and has determined that the discharge is or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to, an excursion above any numeric water quality objective".

The most recent toxic chemical data report does not indicate any reportable off-site releases or discharges to the collection system for this facility. Therefore, a reasonable potential analysis based on information from Emergency Planning and Community Right to Know Act (EPCRA) cannot be conducted. Based on information from EPCRA, there is no reasonable potential to cause or contribute to an excursion above any numeric water quality objectives included within the Basin Plan or in any State Water Board plan, so no effluent limitations are included in this permit pursuant to CWC section 13263.6(a).

However, as detailed elsewhere in this Order, available effluent data indicate that there are constituents present in the effluent that have a reasonable potential to cause or contribute to exceedances of water quality standards and require inclusion of effluent limitations based on federal and state laws and regulations.

5. ***Stormwater Requirements.*** USEPA promulgated Federal Regulations for storm water on 16 November 1990 in 40 CFR Parts 122, 123, and 124. The NPDES Industrial Storm Water Program regulates storm water discharges from wastewater treatment facilities. Wastewater treatment plants are applicable industries under the stormwater program and are obligated to comply with the Federal Regulations.

6. ***Endangered Species Act.*** This Order does not authorize any act that results in the taking of a threatened or endangered species or any act that is now prohibited, or becomes prohibited in the future, under either the California Endangered Species Act (Fish and Game Code sections 2050 to 2097) or the Federal Endangered Species Act (16 U.S.C.A. sections 1531 to 1544). This Order requires compliance with effluent limits, receiving water limits, and other requirements to protect the beneficial uses of waters of the state. The Discharger is responsible for meeting all requirements of the applicable Endangered Species Act.

D. Impaired Water Bodies on CWA 303(d) List

1. Under Section 303(d) of the 1972 Clean Water Act, states, territories and authorized tribes are required to develop lists of water quality limited segments. The waters on these lists do not meet water quality standards, even after point sources of pollution have installed the minimum required levels of pollution control technology. On July 25, 2003 USEPA gave final approval to California's 2002 Section 303(d) List of Water Quality Limited Segments. The Basin Plan references this list of Water Quality Limited Segments (WQLSs), which are defined as "...*those sections of lakes,*

streams, rivers or other fresh water bodies where water quality does not meet (or is not expected to meet) water quality standards even after the application of appropriate limitations for point sources (40 CFR 130, et seq.)." The Basin Plan also states, "*Additional treatment beyond minimum federal standards will be imposed on dischargers to [WQLSs]. Dischargers will be assigned or allocated a maximum allowable load of critical pollutants so that water quality objectives can be met in the segment.*" The 2006 303(d) list for Putah Creek (Solano Lake to Putah Creek Sinks) includes mercury and metals. The Sacramento River (Knights Landing to the Delta) is 303(d) listed for diazinon, mercury, and unknown toxicity.

2. **Total Maximum Daily Loads.** The US EPA requires the Regional Water Board to develop total maximum daily loads (TMDLs) for each 303(d) listed pollutant and water body combination. Putah Creek is listed as an impaired water body for mercury and metals. The Order may be reopened if a TMDL program is established.

E. Other Plans, Polices and Regulations

1. The discharge authorized herein and the treatment and storage facilities associated with the discharge of treated municipal wastewater, except for discharges of residual sludge and solid waste, are exempt from the requirements of Title 27, California Code of Regulations (CCR), section 20005 *et seq.* (hereafter Title 27). The exemption, pursuant to Title 27 CCR section 20090(a), is based on the following:

   a. The waste consists primarily of domestic sewage and treated effluent;

   b. The waste discharge requirements are consistent with water quality objectives; and

   c. The treatment and storage facilities described herein are associated with a municipal wastewater treatment plant.

2. The State Water Board adopted the *Water Quality Control Policy for the Enclosed Bays and Estuaries of California.* The requirements within this Order are consistent with the Policy.

IV. RATIONALE FOR EFFLUENT LIMITATIONS AND DISCHARGE SPECIFICATIONS

Effluent limitations and toxic and pretreatment effluent standards established pursuant to Sections 301 (Effluent Limitations), 302 (Water Quality Related Effluent Limitations), 304 (Information and Guidelines), and 307 (Toxic and Pretreatment Effluent Standards) of the Clean Water Act (CWA) and amendments thereto are applicable to the discharge.

The Federal CWA mandates the implementation of effluent limitations that are as stringent as necessary to meet water quality standards established pursuant to state or federal law [33 U.S.C., § 1311(b)(1)(C); 40 CFR, § 122.44(d)(1)]. NPDES permits must incorporate discharge limits necessary to ensure that water quality standards are met. This requirement applies to narrative criteria as well as to criteria specifying maximum

amounts of particular pollutants. Pursuant to Federal Regulations, 40 CFR Section 122.44(d)(1)(i), NPDES permits must contain limits that control all pollutants that "*are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any state water quality standard, including state narrative criteria for water quality.*" Federal Regulations, 40 CFR, §122.44(d)(1)(vi), further provide that "[w]*here a state has not established a water quality criterion for a specific chemical pollutant that is present in an effluent at a concentration that causes, has the reasonable potential to cause, or contributes to an excursion above a narrative criterion within an applicable State water quality standard, the permitting authority must establish effluent limits.*"

The CWA requires point source discharges to control the amount of conventional, non-conventional, and toxic pollutants that are discharged into the waters of the United States. The control of pollutants discharged is established through effluent limitations and other requirements in NPDES permits. There are two principal bases for effluent limitations: 40 CFR §122.44(a) requires that permits include applicable technology-based limitations and standards, and 40 CFR §122.44(d) requires that permits include water quality-based effluent limitations to attain and maintain applicable numeric and narrative water quality criteria to protect the beneficial uses of the receiving water where numeric water quality objectives have not been established. The Regional Water Board's Basin Plan, page IV-17.00, contains an implementation policy ("Policy for Application of Water Quality Objectives" that specifies that the Regional Water Board "*will, on a case-by-case basis, adopt numerical limitations in orders which will implement the narrative objectives.*" This Policy complies with 40 CFR §122.44(d)(1). With respect to narrative objectives, the Regional Water Board must establish effluent limitations using one or more of three specified sources, including (1) EPA's published water quality criteria, (2) a proposed state criterion (*i.e.*, water quality objective) or an explicit state policy interpreting its narrative water quality criteria (*i.e.*, the Regional Water Board's "Policy for Application of Water Quality Objectives")(40 CFR 122.44(d)(1)(vi) (A), (B) or (C)), or (3) an indicator parameter. The Basin Plan contains a narrative objective requiring that: "*All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life*" (narrative toxicity objective). The Basin Plan requires the application of the most stringent objective necessary to ensure that surface water and groundwater do not contain chemical constituents, discoloration, toxic substances, radionuclides, or taste and odor producing substances that adversely affect beneficial uses. The Basin Plan states that material and relevant information, including numeric criteria, and recommendations from other agencies and scientific literature will be utilized in evaluating compliance with the narrative toxicity objective. The Basin Plan also limits chemical constituents in concentrations that adversely affect surface water beneficial uses. For waters designated as municipal, the Basin Plan specifies that, at a minimum, waters shall not contain concentrations of constituents that exceed Maximum Contaminant Levels (MCL) of CCR Title 22. The Basin Plan further states that, to protect all beneficial uses, the Regional Water Board may apply limits more stringent than MCLs.

A. Discharge Prohibitions

1. *As stated in section I.G of Attachment D, Standard Provisions, this Order prohibits bypass from any portion of the treatment facility. Federal Regulations, 40 CFR 122.41 (m), define "bypass" as the intentional diversion of waste streams from any portion of a treatment facility. This section of the Federal Regulations, 40 CFR 122.41 (m)(4), prohibits bypass unless it is unavoidable to prevent loss of life, personal injury, or severe property damage. In considering the Regional Water Board's prohibition of bypasses, the State Water Board adopted a precedential decision, Order No. WQO 2002-0015, which cites the Federal Regulations, 40 CFR 122.41(m), as allowing bypass only for essential maintenance to assure efficient operation.*

B. Technology-Based Effluent Limitations

1. Scope and Authority

Regulations promulgated in section 125.3(a)(1) require technology-based effluent limitations for municipal Dischargers to be placed in NPDES permits based on Secondary Treatment Standards or Equivalent to Secondary Treatment Standards.

The Federal Water Pollution Control Act Amendments of 1972 (PL 92-500) established the minimum performance requirements for POTWs [defined in section 304(d)(1)]. Section 301(b)(1)(B) of that Act requires that such treatment works must, as a minimum, meet effluent limitations based on secondary treatment as defined by the USEPA Administrator.

Based on this statutory requirement, USEPA developed secondary treatment regulations, which are specified in Part 133. These technology-based regulations apply to all municipal wastewater treatment plants and identify the minimum level of effluent quality attainable by secondary treatment in terms of biochemical oxygen demand (BOD_5), total suspended solids (TSS), and pH.

2. Applicable Technology-Based Effluent Limitations

a. **BOD_5 and TSS.** Federal Regulations, 40 CFR, Part 133, establish the minimum weekly and monthly average level of effluent quality attainable by secondary treatment for BOD_5 and TSS. Tertiary treatment is necessary to protect the beneficial uses of the receiving stream and the final effluent limitations for BOD_5 and TSS are based on the technical capability of the tertiary process. BOD_5 is a measure of the amount of oxygen used in the biochemical oxidation of organic matter. The secondary and tertiary treatment standards for BOD_5 and TSS are indicators of the effectiveness of the treatment processes. The principal design parameter for wastewater treatment plants is the daily BOD_5 and TSS loading rates and the corresponding removal rate of the system. In applying 40 CFR Part 133 for weekly and monthly average BOD_5 and TSS limitations, the application of tertiary treatment processes results in the ability to achieve lower levels for BOD_5 and TSS than the secondary standards currently prescribed; the

30-day average BOD_5 and TSS limitations have been revised to 10 mg/L, which is technically based on the capability of a tertiary system. In addition to the average weekly and average monthly effluent limitations, a daily maximum effluent limitation for BOD_5 and TSS is included in the Order to ensure that the treatment works are not organically overloaded and operate in accordance with design capabilities. See Table F-3 for final technology-based effluent limitations required by this Order. In addition, 40 CFR 133.102, in describing the minimum level of effluent quality attainable by secondary treatment, states that the 30-day average percent removal shall not be less than 85 percent. If 85 percent removal of BOD_5 and TSS must be achieved by a secondary treatment plant, it must also be achieved by a tertiary (i.e., treatment beyond secondary level) treatment plant. This Order contains a limitation requiring an average of 85 percent removal of BOD_5 and TSS over each calendar month.

b. **Flow.** The wastewater treatment plant for the University of California, Davis was designed to provide a tertiary level of treatment for up to a design flow of 3.6 mgd. Therefore, this Order contains an Average Dry Weather Flow effluent limit of 3.6 mgd.

c. **pH.** Federal Regulations, 40 CFR Part 133, also establish technology-based effluent limitations for pH. The secondary treatment standards require the pH of the effluent to be no lower than 6.0 and no greater than 9.0 standard units.

Summary of Technology-based Effluent Limitations
Discharge Points No. 001 & No. 002

Table F-3. Summary of Technology-based Effluent Limitations

Parameter	Units	Effluent Limitations				
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
Flow	mgd	3.6	--	--	--	--
Biochemical oxygen demand, 5-day @ 20°C (BOD_5)[1]	mg/l	10	15	20	--	--
	lbs/day[2]	300	450	600	--	--
Total suspended solids (TSS)[1]	mg/l	10	15	20	--	--
	lbs/day[2]	300	450	600	--	--
pH	SU	--	--	--	6.0[3]	9.0[3]

[1] The average monthly percent removal of BOD 5-day 20°C and total suspended solids shall not be less than 85 percent.
[2] Based on an average dry weather flow of 3.6 mgd.
[3] More stringent water quality-based effluent limitations have been applied for pH in this Order.

C. Water Quality-Based Effluent Limitations (WQBELs)

1. Scope and Authority

As specified in section 122.44(d)(1)(i), permits are required to include WQBELs for pollutants (including toxicity) that are or may be discharged at levels that cause, have reasonable potential to cause, or contribute to an in-stream excursion above any state water quality standard. The process for determining reasonable potential and calculating WQBELs when necessary is intended to protect the designated uses of the receiving water as specified in the Basin Plan, and achieve applicable water quality objectives and criteria that are contained in other state plans and policies, or any applicable water quality criteria contained in the CTR and NTR.

2. Applicable Beneficial Uses and Water Quality Criteria and Objectives

a. **Receiving Water.** The receiving stream is Putah Creek, a tributary to the Sacramento River. The beneficial uses of Putah Creek are described above in Section III.C.1 of this Fact Sheet.

b. **Hardness.** While no effluent limitation for hardness is necessary in this Order, hardness is critical to the assessment of the need for, and the development of, effluent limitations for certain metals. The *California Toxics Rule* and the *National Toxics Rule* contain water quality criteria for seven metals that vary as a function of hardness, the lower the hardness the lower the water quality criteria. The hardness-dependent metal criteria include cadmium, copper, chromium III, lead, nickel, silver, and zinc.

Effluent limitations for the discharge must be set to protect the beneficial uses of the receiving water for all discharge conditions. In the absence of the option of including condition-dependent, "floating" effluent limitations that are reflective of actual hardness conditions at the time of discharge, effluent limitations must be set using a reasonable worst-case condition in order to protect beneficial uses for all discharge conditions. The SIP does not address how to determine hardness for application to the equations for the protection of aquatic life when using hardness-dependent metals criteria. It simply states, in Section 1.2, that the criteria shall be properly adjusted for hardness using the hardness of the receiving water. The CTR requires that, for waters with a hardness of 400 mg/L (as $CaCO_3$), or less, the actual ambient hardness of the surface water must be used. It further requires that the hardness values used must be consistent with the design discharge conditions for design flows and mixing zones.[1] The CTR does not define whether the term "ambient," as applied in the regulations, necessarily requires the consideration of upstream as opposed to downstream hardness conditions.

[1] See 40 CFR 131.38(c)(4)(i)

The point in the receiving water affected by the discharge is downstream of the discharge. As the effluent mixes with the receiving water, the hardness of the receiving water can change. Therefore, it is appropriate to use the ambient hardness downstream of the discharge that is a mixture of the effluent and receiving water for the determination of the CTR hardness-dependent metals criteria. Recent studies indicate that using the lowest recorded receiving water hardness for establishing water quality criteria is not always protective of the receiving water under various mixing conditions (e.g. when the effluent hardness is less than the receiving water hardness). The studies evaluated the relationships between hardness and the CTR metals criterion that is calculated using the CTR metals equation. The equation describing the total recoverable regulatory criterion, as established in the CTR, is as follows:

$$\text{CTR Criterion} = e^{m[\ln(H)]+b} \qquad \text{(Equation 1)}$$

Where:

H = Design Hardness
b = metal- and criterion-specific constant
m = metal- and criterion-specific constant

The constants "m" and "b" are specific to both the metal under consideration, and the type of total recoverable criterion (i.e. acute or chronic). The metal-specific values for these constants are provided in the CTR at paragraph (b)(2), Table 1.

The relationship between the Design Hardness and the resulting criterion in Equation 1 can exhibit either a downward-facing (i.e., concave downward) or an upward-facing (i.e., concave upward) curve depending on the values of the criterion-specific constants. The curve shapes for acute and chronic criteria for the metals are as follows:

Concave Downward: cadmium (chronic), chromium (III), copper, nickel, and zinc

Concave Upward: cadmium (acute), lead, and silver (acute)

For those contaminants where the regulatory criteria exhibit a concave downward relationship as a function of hardness, use of the lowest recorded effluent hardness as a representation of the downstream receiving water hardness for establishment of water quality objectives is fully protective of all beneficial uses regardless of whether the effluent or receiving water hardness is higher. Use of the lowest recorded effluent hardness as receiving water hardness is also protective under all possible mixing conditions between the effluent and the receiving water (i.e., from high dilution to no dilution). Therefore, for cadmium (chronic), chromium (III), copper, nickel, and zinc, the reasonable worst-case ambient hardness can be estimated by using the lowest effluent hardness. The water quality criteria for these metals were calculated for this Order using Equation 1 and a reported minimum effluent hardness of 160 mg/L as CaCO3,

based on 57 samples obtained by the Discharger between January 2004 and May 2007.

For those metals where the regulatory criteria exhibit a concave upward relationship as a function of hardness, water quality objectives based on either the effluent hardness or the receiving water hardness alone, would not be protective under all mixing scenarios. Instead, both the use of the hardness of the upstream receiving water and the effluent is used to represent the reasonable worst-case ambient hardness. In this case, using the lowest upstream receiving water hardness in Equation 2, below, is protective if the effluent hardness is ALWAYS higher than the receiving water hardness. Under circumstances where the effluent hardness is not ALWAYS higher than the receiving water hardness, it may be appropriate to use the highest reported upstream receiving water hardness in Equation 2. The following equation provides fully protective water quality criteria for those metals that exhibit a concave upward relationship.

$$\text{CTR Criterion} = \left[\frac{m}{H_{rw}} \cdot \left(H_{eff} - H_{rw} \right) + 1 \right] \cdot e^{m \cdot \ln(H_{rw}) + b} \qquad \text{(Equation 2)}$$

Where:

H_{eff} = effluent hardness
H_{rw} = upstream receiving water hardness
b = metal- and criterion-specific constant
m = metal- and criterion-specific constant

Therefore, for cadmium (acute), lead, and silver (acute), water quality criteria were calculated using Equation 2 with a lowest reported effluent hardness of 160 mg/L as $CaCO_3$ and a highest reported upstream receiving water hardness of 840 mg/L as $CaCO_3$, based on 57 samples from January 2004 and May 2007.

3. Determining the Need for WQBELs

a. CWA section 301 (b)(1) requires NPDES permits to include effluent limitations that achieve technology-based standards and any more stringent limitations necessary to meet water quality standards. Water quality standards include Regional Water Board Basin Plan beneficial uses and narrative and numeric water quality objectives, State Water Board-adopted standards, and federal standards, including the CTR and NTR. The Basin Plan includes numeric site-specific water quality objectives and narrative objectives for toxicity, chemical constituents, and tastes and odors. The narrative toxicity objective states: "*All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life.*" (Basin Plan at III-8.00.) With regards to the narrative chemical constituents objective, the Basin Plan states that waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses. At minimum,

"...*water designated for use as domestic or municipal supply (MUN) shall not contain concentrations of chemical constituents in excess of the maximum contaminant levels (MCLs)*" in Title 22 of CCR. The narrative tastes and odors objective states: "*Water shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to domestic or municipal water supplies or to fish flesh or other edible products of aquatic origin, or that cause nuisance, or otherwise adversely affect beneficial uses.*"

b. Federal regulations require effluent limitations for all pollutants that are or may be discharged at a level that will cause or have the reasonable potential to cause, or contribute to an in-stream excursion above a narrative or numerical water quality standard. Based on information submitted as part of the application, in studies, and as directed by monitoring and reporting programs, the Regional Water Board finds that the discharge has a reasonable potential to cause or contribute to an in-stream excursion above a water quality standard for aluminum, ammonia, chloride, cyanide, nitrate + nitrite, selenium, specific conductance (EC), and total dissolved solids (TDS). Water quality-based effluent limitations (WQBELs) for these constituents are included in this Order. A summary of the reasonable potential analysis (RPA) is provided in Attachment G, and a detailed discussion of the RPA for each constituent is provided below.

c. The Regional Water Board conducted the RPA in accordance with Section 1.3 of the SIP. Although the SIP applies directly to the control of CTR priority pollutants, the State Water Board has held that the Regional Water Board may use the SIP as guidance for water quality-based toxics control.[2] The SIP states in the introduction "*The goal of this Policy is to establish a standardized approach for permitting discharges of toxic pollutants to non-ocean surface waters in a manner that promotes statewide consistency.*" Therefore, in this Order the RPA procedures from the SIP were used to evaluate reasonable potential for both CTR and non-CTR constituents.

d. WQBELs were calculated in accordance with section 1.4 of the SIP, as described in Attachment F, Section IV.C.4.

e. **Aluminum.** The Secondary Maximum Contaminant Level (MCL) for aluminum for the protection of the human health (MUN beneficial use) is 200 µg/L. In addition, the USEPA developed National Recommended Ambient Water Quality Criteria (NRAWQC) for protection of freshwater aquatic life for aluminum. The recommended four-day average (chronic) and one-hour average (acute) criteria for aluminum are 87 µg/L and 750 µg/L, respectively, for waters with a pH of 6.5 to 8.5. However, information contained in Footnote L to the NRAWQC summary table indicates that the development of the chronic criterion was based on specific receiving water conditions where there is low pH (6.5 to 6.8 pH units) and low hardness levels (< 10 mg/L as CaCO3). Monitoring data demonstrates

that these conditions are not similar to those in Putah Creek, which has been measured to have a pH of 8.3 and hardness of 180 mg/L as $CaCO_3$.

The MEC for aluminum was 251.80 µg/L, based on 66 samples collected between January 2003 and May 2007, while the maximum observed upstream receiving water aluminum concentration was 526 µg/L, based on 12 samples collected between January 2002 and December 2002. Therefore, aluminum in the discharge has a reasonable potential to cause or contribute to an in-stream excursion above a level necessary to protect the MUN beneficial use.

Based on the above information, using the chronic criterion recommended in the NAWQC (87 µg/L) is not appropriate for the receiving water. Therefore, this Order contains final Average Monthly Effluent Limitations (AMEL) and Maximum Daily Effluent Limitations (MDEL) for aluminum of 276 µg/L and 750 µg/L, respectively, based on USEPA's National Ambient Water Quality Criteria for the protection of freshwater aquatic life (See Attachment F, Table F-5 for WQBEL calculations). This Order also contains an annual average effluent limitation of 200 µg/L for aluminum, based on the Secondary MCL, for protection of the MUN beneficial use.

f. **Ammonia.** Untreated domestic wastewater contains ammonia. Nitrification is a biological process that converts ammonia to nitrite and nitrite to nitrate. Denitrification is a process that converts nitrate to nitrite or nitric oxide and then to nitrous oxide or nitrogen gas, which is then released to the atmosphere. The Discharger currently uses nitrification to remove ammonia from the waste stream. Inadequate or incomplete nitrification may result in the discharge of ammonia to the receiving stream. Ammonia is known to cause toxicity to aquatic organisms in surface waters. Discharges of ammonia would violate the Basin Plan narrative toxicity objective. Applying 40 CFR section122.44(d)(1)(vi)(B), it is appropriate to use USEPA's Ambient National Water Quality Criteria for the Protection of Freshwater Aquatic Life for ammonia, which was developed to be protective of aquatic organisms.

USEPA's *Ambient Water Quality Criteria for the Protection of Freshwater Aquatic Life*, for total ammonia, recommends acute (1-hour average; criteria maximum concentration) standards based on pH and chronic (30-day average, criteria continuous concentration) standards based on pH and temperature. It also recommends a maximum four-day average concentration of 2.5 times the criteria continuous concentration. USEPA found that as pH increased, both the acute and chronic toxicity of ammonia increased. Salmonids were more sensitive to acute toxicity effects than other species. However, while the acute toxicity of ammonia was not influenced by temperature, it was found that invertebrates and young fish experienced increasing chronic toxicity effects with increasing temperature. Because Putah Creek has a beneficial use of cold freshwater habitat and the presence of salmonids and early fish life stages in Putah Creek is well-documented, the recommended criteria for waters where salmonids and early life stages are present were used. USEPA's recommended criteria are

show below:

$$CCC_{30-day} = \left(\frac{0.0577}{1+10^{7.688-pH}} + \frac{2.487}{1+10^{pH-7.688}}\right) \times MIN\left(2.85, 1.45 \cdot 10^{0.028(25-T)}\right), \text{ and}$$

$$CMC = \left(\frac{0.275}{1+10^{7.204-pH}} + \frac{39.0}{1+10^{pH-7.204}}\right),$$

where T is in degrees Celsius

The temperature of the effluent and receiving streams vary seasonally. As requested by the Discharger, this Order contains seasonal limitations for ammonia.

The maximum permitted effluent pH is 8.5. The Basin Plan objective for pH in the receiving stream is in the range of 6.5 to 8.5.

Acute and chronic ammonia toxicity criteria were calculated using data from 1 May through 31 October (summer) and 1 November through 30 April (winter) for receiving water pH and temperature.

An acute ammonia toxicity criterion was calculated using the maximum observed effluent pH value of 8.5 pH units and the CMC equation based on the salmonids present. The resulting CMC for ammonia is 2.14 mg/L.

The 30-day average CCC is calculated using the temperature and pH of the receiving water. Using effluent data from 1 May through 31 October and 1 November through 30 April, the CCC was calculated for each day when temperature and pH were measured. The lowest 99.9% 30-day average CCC was 0.61 mg/L from 1 May through 31 October and 1.17 mg/L from 1 November through 30 April. The corresponding pH used was 8.45 from 1 May through 31 October and 8.33 from 1 November through 30 April.

The 4-day average concentration is derived in accordance with the USEPA criterion as 2.5 times the 30-day CCC. Based on the 30-day CCC of 0.61 mg/L and 1.17 mg/L, the 4-day average concentration that should not be exceeded is 1.52 mg/L from 1 May through 31 October and 2.93 mg/L from 1 November through 30 April.

Ammonia is a non-CTR constituent and WQBELS are calculated in accordance with SIP procedures for non-CTR constituents. The SIP procedure assumes a 4-day averaging period for calculating the long-term average discharge condition (LTA). USEPA recommends modifying the procedure for calculating permit limits for ammonia using a 30-day averaging period for the calculation of the LTA corresponding to the 30-day chronic criteria. While the LTAs corresponding to the acute and 4-day chronic criteria were calculated according to SIP procedures, the LTA corresponding to the 30-day chronic criteria was calculated assuming a 30-day averaging period. The lowest LTA representing the acute 4-

day averaging and 30-day chronic criteria is then selected for deriving the AMEL and MDEL. The remainder of the WQBEL calculation for ammonia was performed according to the SIP procedures.

This Order contains seasonal AMELs and MDELs for ammonia of 0.74 mg/L and 1.53 mg/L from 1 May through 31 October and 1.11 mg/L and 2.14 mg/L from 1 November through 30 April, respectively, based on the USEPA's National Ambient Water Quality Criteria for the Protection of Freshwater Aquatic Life (see Attachment F-6 for the WQBEL calculations for ammonia).

g. **Chlorine Residual.** The Discharger has not used chlorine, which is extremely toxic to aquatic organisms, for disinfection in the treatment process or for cleaning the facility since January 2003. The Discharger now uses an ultraviolet (UV) light disinfection system prior to discharge to Putah Creek. However, the Discharger would like to reserve the option to use chlorine for cleaning and maintenance purposes on the new disc filter. Since the Discharger requested the use of chlorine for maintenance purposes, the discharge has a reasonable potential to cause or contribute to an in-stream excursion above the Basin Plan's narrative toxicity objective. A monitoring requirement is required for instances when chlorine is used for maintenance purposes.

   The USEPA Technical Support Document for Water Quality-Based Toxics Control [EPA/505/2-90-001] contains statistical methods for converting chronic (four-day) and acute (one-hour) aquatic life criteria to average monthly and maximum daily effluent limitations based on the variability of the existing data and the expected frequency of monitoring. However, because chlorine is an acutely toxic constituent, an average one-hour limitation is considered more appropriate than an average daily limitation. Average one-hour and four-day limitations for chlorine, based on these criteria, are included in this Order. The Discharger can immediately comply with these new effluent limitations for chlorine residual.

   The chlorine residual limitations required in this Order are protective of aquatic organisms in the undiluted discharge. If compliance is maintained, the Regional Water Board does not anticipate residual chlorine impacts to benthic organisms.

h. **Copper.** The CTR includes hardness-dependent criteria for the protection of freshwater aquatic life for copper. The criteria for copper are presented in dissolved concentrations. USEPA recommends conversion factors to translate dissolved concentrations to total concentrations. The USEPA default conversion factors for copper in freshwater are 0.96 for both the acute and the chronic criteria. Using an estimated reasonable worst-case ambient hardness, as described in Section IV.C.2.b., above, 160 mg/L as $CaCO_3$ and the USEPA recommended dissolved-to-total translator, the applicable chronic criterion (maximum four-day average concentration) is 14 µg/L and the applicable acute criterion (maximum one-hour average concentration) is 22 µg/L, as total recoverable.

The MEC for total copper was 10.0 µg/L, based on 43 samples collected between August 2004 and May 2007, while the maximum observed upstream receiving water total copper concentration was 6.0 µg/L, based on 12 samples collected between January 2002 and December 2002. Therefore, the discharge does not demonstrate reasonable potential to cause or contribute to an in-stream excursion above the CTR criteria for copper.

The previous Order required effluent limitations for copper. However, based on new information and the procedures established in Section 1.3 of the SIP for determining reasonable potential, the discharge no longer demonstrates reasonable potential to exceed water quality criteria for copper. Therefore, effluent limitations for copper are no longer necessary. The removal of the effluent limitations for copper is in compliance with 40 CFR 122.44(l)(2)(i)(B)(1).

i. **Cyanide.** The CTR includes maximum 1-hour average and 4-day average cyanide concentrations of 22 µg/L and 5.2 µg/L, respectively, for the protection of freshwater aquatic life. The MEC for cyanide was 6.1 µg/L, based on 59 samples collected between January 2003 and May 2007, while the maximum observed upstream receiving water cyanide concentration was 6.7 µg/L, based on 12 samples collected between January 2003 and May 2007. Therefore, the discharge has a reasonable potential to cause or contribute to an in-stream excursion above the CTR criteria for cyanide. An AMEL and MDEL for cyanide of 4.3 µg/L and 8.5 µg/L, respectively, are included in this Order based on CTR criteria for the protection of freshwater aquatic life (See Attachment F, Table F-7 for WQBEL calculations).

j. **Dichloromethane.** The human health criteria for dichloromethane is 4.7 µg/L for water and organisms. The MEC for dichloromethane was 1.70 µg/L, based on 20 samples collected between February 2003 and May 2007, while the maximum observed upstream receiving water dichloromethane concentration was 2.0 µg/L, based on 12 samples collected between January 2002 and December 2002. Therefore, the discharge does not demonstrate reasonable potential to cause or contribute to an in-stream excursion above the CTR criteria for dichloromethane

The previous Order required effluent limitations for dichloromethane. However, based on new information and the procedures established in Section 1.3 of the SIP for determining reasonable potential, the discharge no longer demonstrates reasonable potential to exceed water quality criteria for dichloromethane. Therefore, effluent limitations for dichloromethane are no longer necessary. The removal of the effluent limitations for dichloromethane is in compliance with 40 CFR 122.44(l)(2)(i)(B)(1).

k. **Dioxin/Furans.** Dioxin/furans was never detected in the effluent, based on 11 sampling periods between March 2004 through January 2007, while the maximum observed upstream receiving water dioxin/furan concentration was 0.0005 pg/L, based on 12 samples collected between January 2002 and

December 2002. Therefore, the discharge does not demonstrate reasonable potential to cause or contribute to an in-stream excursion above the CTR criteria.

The previous Order required effluent limitations for dioxin/furans of 0.14 pg/l. The effluent has not been observed to exceed the narrative objective for settleable solids in the Basin Plan. Therefore, effluent limitations for dioxin/furans are no longer necessary. The removal of the effluent limitations for dioxin/furans is in compliance with 40 CFR 122.44(l)(2)(i)(B)(1).

l. **Electrical Conductivity. (see Subsection t. Salinity)**

m. **Iron.** The Secondary Maximum Contaminant Level (MCL) for iron for the protection of the human health (MUN beneficial use), as set forth by the Department of Public Health, is 300 µg/L.

The Maximum Effluent Concentration (MEC) for iron was 145 µg/L, based on 55 samples collected between February 2003 and May 2007, and the maximum reported background receiving water iron concentration was 988 µg/L. The discharge has a reasonable potential to cause or contribute to an in-stream excursion above the secondary MCL for iron. The previous Order contained a final monthly effluent limitation for iron due to the iron concentration in the receiving stream being above the criteria. The iron concentration in the receiving water continues to be above the criteria, therefore, a final monthly average effluent limitation of 300 µg/L for iron is included in this Order.

n. **Lead.** The CTR includes hardness-dependant criteria for the protection of freshwater aquatic life for lead. The criteria for lead are presented in dissolved concentrations. USEPA recommends conversion factors to translate dissolved concentrations to total concentrations. The USEPA default conversion factors for copper in freshwater are 1.27 for both the acute and the chronic criteria. Using and estimated reasonable worst-case ambient hardness, as described in Section IV.C.2.b., above, 160 mg/L as $CaCO_3$ and the USEPA recommended dissolved-to-total translator, the applicable chronic criterion (maximum four-day average concentration) is 4 µg/L and the applicable acute criterion (maximum one-hour average concentration) is 107 µg/L, as total recoverable.

The MEC for lead was 0.49 µg/L, based on 56 samples collected between February 2003 and May 2007, while the maximum observed upstream receiving water lead concentration was 2.10 µg/L, based on 12 samples collected between January 2002 and December 2002. Therefore, the discharge does not demonstrate reasonable potential to cause or contribute to an in-stream excursion above the CTR criteria for lead.

The previous Order required effluent limitations for lead. However, based on new information and the procedures established in Section 1.3 of the SIP for determining reasonable potential, the discharge no longer demonstrates reasonable potential to exceed water quality criteria for lead. Therefore, effluent

limitations for lead are no longer necessary. The removal of the effluent limitations for lead is in compliance with 40 CFR 122.44(l)(2)(i)(B)(1).

o. **Manganese.** The secondary MCL – consumer acceptance limit for manganese is 50 µg/L. The MEC for manganese was 3 µg/L, based on 10 samples collected between February 2003 and May 2007, and the maximum reported background receiving water manganese concentration was 83.7 µg/L. The discharge has reasonable potential to cause or contribute to an in-stream excursion above the Basin Plan's site-specific objective for manganese. However, manganese is a secondary MCL constituent in which the threat being protected against is a chronic, long term threat and not an acute threat. Although the manganese concentration in the receiving stream is above the criteria, the average effluent concentration is low enough in which it does not appear to be the potential cause for exceedance to the water quality criteria that is implemented as an annual average. Therefore, no effluent limitation for manganese is included in this Order.

p. **Mercury, Total.** The current USEPA Ambient Water Quality Criteria for Protection of Freshwater Aquatic Life, continuous concentration, for mercury is 0.77 µg/L (30-day average, chronic criteria). The CTR contains a human health criterion of 0.050 µg/L for waters from which both water and aquatic organisms are consumed. Both values are controversial and subject to change. In 40 CFR Part 131, USEPA acknowledges that the human health criteria may not be protective of some aquatic or endangered species and that "*...more stringent mercury limits may be determined and implemented through use of the State's narrative criterion.*" In the CTR, USEPA reserved the mercury criteria for freshwater and aquatic life and may adopt new criteria at a later date. The maximum observed effluent mercury concentration was 0.0093 µg/L. Putah Creek has been listed as an impaired water body pursuant to Section 303(d) of the Clean Water Act because of mercury. Mercury bioaccumulates in fish tissue and, therefore, discharge of mercury to the receiving water is likely to contribute to exceedances of the narrative toxicity objective and impacts on beneficial uses. Because Putah Creek has been listed as an impaired water body for mercury, the discharge must not cause or contribute to increased mercury levels. The SIP, Section 1.3, requires the establishment of an effluent limitation for a constituent when the receiving stream background water quality exceeds an applicable criterion or objective.

Regional Water Board staff is currently developing a TMDL for methylmercury for the Sacramento-San Joaquin Delta. The SIP recommends the Regional Water Board consider whether the mass loading of bioaccumulative pollutants should be limited in the interim to "*representative current levels*" pending development of applicable water quality standards or TMDL allocation. The intent is, at a minimum, to prevent further impairment while a TMDL for a particular bioaccumulative constituent is being developed. Any increase in loading of mercury to an already impaired water body would further degrade water quality.

This Order contains an interim performance-based mass Effluent Limitation of 0.10 lbs/year for total mercury for the effluent discharge to Putah Creek. This limitation is based on maintaining the mercury loading at the current level until a total maximum daily load (TMDL) can be established and USEPA develops mercury standards that are protective of human health. The mass limitation was derived using the maximum observed effluent mercury concentration and the reported average dry weather flow rate. If USEPA develops new water quality standards for mercury, this permit may be reopened and the Effluent Limitations adjusted.

q. **Nitrite and Nitrate.** Untreated domestic wastewater contains ammonia. Nitrification is a biological process that converts ammonia to nitrite and nitrite to nitrate. Denitrification is a process that converts nitrate to nitrite or nitric oxide and then to nitrous oxide or nitrogen gas, which is then released to the atmosphere. Nitrate and nitrite are known to cause adverse health effects in humans. The California DHS has adopted Primary MCLs at Title 22 of the California Code of Regulations (CCR), Table 64431-A, for the protection of human health for nitrite and nitrate that are equal to 1 mg/L and 10 mg/L (measured as nitrogen), respectively. Title 22 CCR, Table 64431-A, also includes a primary MCL of 10,000 µg/L for the sum of nitrate and nitrite, measured as nitrogen.

   USEPA has developed a primary MCL and an MCL goal of 1,000 µg/L for nitrite (as nitrogen). For nitrate, USEPA has developed Drinking Water Standards (10,000 µg/L as Primary Maximum Contaminant Level) and Ambient Water Quality Criteria for protection of human health (10,000 µg/L for non-cancer health effects). Recent toxicity studies have indicated a possibility that nitrate is toxic to aquatic organisms.

   Inadequate or incomplete denitrification may result in the discharge of nitrate and/or nitrite to the receiving stream. The conversion of ammonia to nitrites and the conversion of nitrites to nitrates present a reasonable potential for the discharge to cause or contribute to an in-stream excursion above the Primary MCLs for nitrite and nitrate. AMEL for nitrite + nitrate of 10 mg/L, respectively, is included in this Order based on the MCLs. These effluent limitations are included in this Order to assure the treatment process adequately nitrifies and denitrifies the waste stream to protect the beneficial use of municipal and domestic supply.

r. **Pathogens**. The beneficial uses of Putah Creek include municipal and domestic supply, water contact recreation, and agricultural irrigation supply, and there is, at times, less than 20:1 dilution. To protect these beneficial uses, the Regional Water Board finds that the wastewater must be disinfected and adequately treated to prevent disease. The principal infectious agents (pathogens) that may be present in raw sewage may be classified into three broad groups: bacteria, parasites, and viruses. Tertiary treatment, consisting of chemical coagulation, sedimentation, and filtration, has been found to remove approximately 99.5% of viruses. Filtration is an effective means of reducing viruses and parasites from

the waste stream. The wastewater must be treated to tertiary standards (filtered), or equivalent, to protect contact recreational and food crop irrigation uses.

The California Department of Public Health (DPH) has developed reclamation criteria, CCR, Division 4, Chapter 3 (Title 22), for the reuse of wastewater. Title 22 requires that for spray irrigation of food crops, parks, playgrounds, schoolyards, and other areas of similar public access, wastewater be adequately disinfected, oxidized, coagulated, clarified, and filtered, and that the effluent total coliform levels not exceed 2.2 MPN/100 m*l* as a 7-day median. As coliform organisms are living and mobile, it is impracticable to quantify an exact number of coliform organisms and to establish weekly average limitations. Instead, coliform organisms are measured as a most probable number and regulated based on a 7-day median limitation.

Title 22 also requires that recycled water used as a source of water supply for non-restricted recreational impoundments be disinfected tertiary recycled water that has been subjected to conventional treatment. A non-restricted recreational impoundment is defined as "*...an impoundment of recycled water, in which no limitations are imposed on body-contact water recreational activities.*" Title 22 is not directly applicable to surface waters; however, the Regional Water Board finds that it is appropriate to apply an equivalent level of treatment to that required by DPH's reclamation criteria because the receiving water is used for irrigation of agricultural land and for contact recreation purposes. The stringent disinfection criteria of Title 22 are appropriate since the undiluted effluent may be used for the irrigation of food crops and/or for body-contact water recreation. Coliform organisms are intended as an indicator of the effectiveness of the entire treatment train and the effectiveness of removing other pathogens. The method of treatment is not prescribed by this Order; however, wastewater must be treated to a level equivalent to that recommended by DPH.

In addition to coliform testing, turbidity specifications have been included as a second indicator of the effectiveness of the treatment process and to assure compliance with the required level of treatment. The previous Order established effluent limitations for turbidity, based on DPH's Title 22 requirements, including a daily average of 2 nephelometric turbidity units (NTU). The previous Order also prohibited the effluent from exceeding 5 NTU more than 5 percent of the time, and prohibited the effluent from exceeding 10 NTU at any given time if the effluent was continuously monitored. Failure of the filtration system such that virus removal is impaired could result in increased particles in the effluent, which result in higher effluent turbidity. Turbidity has a major advantage for monitoring filter performance, allowing immediate detection of filter failure and rapid corrective action. Coliform testing, by comparison, is not conducted continuously and requires several hours, to days, to identify high coliform concentrations. The limitations in the previous Order were solely an operational check to ensure the treatment system was functioning properly. The effluent limitations were not intended to regulate turbidity discharged to the receiving water. Rather, turbidity

should be an operational parameter to determine proper system function and not a WQBEL. Therefore, to ensure compliance with the DPH recommended Title 22 disinfection criteria, this Order contains operational turbidity specifications to be met prior to disinfection in lieu of effluent limitations.

This Order requires a tertiary level of treatment, or equivalent, necessary to protect the beneficial uses of the receiving water. The Regional Water Board has previously considered the factors in CWC section 13241.

s. **pH.** The Basin Plan includes a water quality objective for surface waters (except for Goose Lake) that the "*...pH shall not be depressed below 6.5 nor raised above 8.5. Changes in normal ambient pH levels shall not exceed 0.5 in fresh waters with designated COLD or WARM beneficial uses.*" Effluent Limitations for pH are included in this Order based on the Basin Plan objectives for pH.

t. **Salinity.** The discharge contains total dissolved solids (TDS), chloride, sulfate, and electrical conductivity (EC). These are water quality parameters that are indicative of the salinity of the water. Their presence in water can be growth limiting to certain agricultural crops and can affect the taste of water for human consumption. There are no USEPA water quality criteria for the protection of aquatic organisms for these constituents. The Basin Plan contains a chemical constituent objective that incorporates State MCLs, contains a narrative objective, and contains numeric water quality objectives for EC, TDS, Sulfate, and Chloride.

Table F-4. Salinity Water Quality Criteria/Objectives

Parameter	Agricultural WQ Goal[1]	Secondary MCL[2]	Effluent	
			Avg	Max
EC (µmhos/cm)	700[3]	900, 1600, 2200	1091	1679
TDS (mg/L)	450[3]	500, 1000, 1500	634	848
Sulfate (mg/L)	N/A	250, 500, 600	44	49
Chloride (mg/L)	106[3]	250, 500, 600	149	195

[1] Agricultural water quality goals based on *Water Quality for Agriculture*, Food and Agriculture Organization of the United Nations—Irrigation and Drainage Paper No. 29, Rev. 1 (R.S. Ayers and D.W. Westcot, Rome, 1985)

[2] The secondary MCLs are stated as a recommended level, upper level, and a short-term maximum level.

[3] Agricultural water quality goals listed provide no restrictions on crop type or irrigation methods for maximum crop yield. Higher concentrations may require special irrigation methods to maintain crop yields or may restrict types of crops grown.

i. **Chloride**. The secondary MCL for chloride is 250 mg/L, as recommended level, 500 mg/L as an upper level, and 600 mg/L as a short-term maximum. The recommended agricultural water quality goal for chloride, that would

apply the narrative chemical constituent objective, is 106 mg/L as a long-term average based on Water Quality for Agriculture, Food and Agriculture Organization of the United Nations—Irrigation and Drainage Paper No. 29, Rev. 1 (R.S. Ayers and D.W. Westcot, Rome, 1985). The 106 mg/L water quality goal is intended to protect against adverse effects on sensitive crops when irrigated via sprinklers.

Chloride concentrations in the effluent ranged from 97.6 mg/L to 195.4 mg/L, with an average of 149.2 mg/L, for 11 samples collected by the Discharger from March 2004 through January 2007. Background concentrations in Putah Creek ranged from 11 mg/L to 35 mg/L, with an average of 20.3 mg/L, for 12 samples collected by the Discharger from January 2002 through December 2002. The effluent exceeds the agricultural water quality goal of 106 mg/L. The 106 mg/L agricultural water quality goal is intended to prevent reduction in crop yield, i.e. a restriction on use of water, for salt-sensitive crops, such as beans, carrots, turnips, and strawberries. These crops are either currently grown in the area or may be grown in the future. Most other crops can tolerate higher chloride concentrations without harm, however, as the salinity of the irrigation water increases, more crops are potentially harmed by the chloride, or extra measures must be taken by the farmer to minimize or eliminate any harmful impacts.

EC, TDS, and chloride are measures of the salinity of the wastewater. This Order contains effluent limitations for EC and TDS, and requirements for the Discharger to continue salinity minimization efforts. In addition, the Discharger is required to conduct a site-specific study to determine the salinity levels that are necessary to adequately protect the agricultural water supply beneficial uses of the receiving water. In this Order, EC is used as an indicator parameter for salinity. Establishing an effluent limitation for EC is expected to effectively control the constituents that contribute to salinity, including chloride. Therefore, effluent limits for chloride are not included. Effluent monitoring of chloride has been required to verify that chloride is effectively controlled using EC as an indicator parameter.

ii. **Electrical Conductivity (EC)**. The secondary MCL for EC is 900 µmhos/cm as a recommended level, 1,600 µmhos/cm as an upper level, and 2,200 µmhos/cm as a short-term maximum. The agricultural water quality goal, that would apply the narrative chemical constituents objective, is 700 µmhos/cm as a long-term average based on Water Quality for Agriculture, Food and Agriculture Organization of the United Nations—Irrigation and Drainage Paper No. 29, Rev. 1 (R.S. Ayers and D.W. Westcot, Rome, 1985). The 700 µmhos/cm agricultural water quality goal is intended to prevent reduction in crop yield, i.e. a restriction on use of water, for salt-sensitive crops, such as beans, carrots, turnips, and strawberries. These crops are either currently grown in the area or may be grown in the future. Most other crops can tolerate higher EC concentrations without harm, however, as the salinity of the irrigation water increases, more crops are

potentially harmed by the EC, or extra measures must be taken by the farmer to minimize or eliminate any harmful impacts.

A review of the Discharger's monitoring reports from January 2003 through May 2007 shows an average monthly effluent EC of 1,091 µmhos/cm, with a range from 103 µmhos/cm to 1,679 µmhos/cm for 1,594 samples. These levels exceed the applicable objectives. The background receiving water EC averaged 476 µmhos/cm in 746 sampling events collected by the Discharger from January 2004 through May 2007.

Analysis of receiving water EC data for the South Fork of Putah Creek resulted in a maximum running 30-day average EC of 599 umhos/cm during irrigation season months of April through August, a maximum running 30-day average of 684 umhos/cm during other months, and a maximum daily EC level of 877 umhos/cm. The receiving water EC data indicates that municipal water quality objectives for the receiving stream are being met during the existing discharge and "reasonable potential" does not exist for exceedance of the DPH recommended standard of 900 umhos/cm that serves as the basis of the existing EC effluent limitation.

A performance based interim limit of 1,400 µmhos/cm is added to this Order is accordance with current Regional Water Board management guidance. Despite efforts to minimize sources of salinity within the service area and treatment facility, the Discharger has not been able to comply with the final EC effluent limitation of 900 µmhos/cm. The Discharger has also conducted several studies to identify and minimize salinity sources and has found that it will be necessary to change water supplies to meet the secondary MCL of 900 µmhos/cm, which could take many years to accomplish.

iii. **Sulfate**. The secondary MCL for sulfate is 250 mg/L as recommended level, 500 mg/L as an upper level, and 600 mg/L as a short-term maximum. Sulfate concentrations in the effluent ranged from 38 mg/L to 49 mg/L, with an average of 44 mg/L, for 11 samples collected by the Discharger from March 2004 through January 2007. Background concentrations in Putah Creek ranged from 18 mg/L to 48 mg/L, with an average of 33 mg/L, for 12 samples collected by the Discharger from January 2002 through December 2002. The effluent does not exceed the secondary MCL recommended level of 250 mg/L.

iv. **Total Dissolved Solids (TDS)**. The secondary MCL for TDS is 500 mg/L as a recommended level, 1000 mg/L as an upper level, and 1500 mg/L as a short-term maximum. The recommended agricultural water quality goal for TDS, that would apply the narrative chemical constituent objective, is 450 mg/L as a long-term average based on Water Quality for Agriculture, Food and Agriculture Organization of the United Nations—Irrigation and Drainage Paper No. 29, Rev. 1 (R.S. Ayers and D.W. Westcot, Rome, 1985). Water Quality for Agriculture evaluates the impacts of salinity levels on crop

tolerance and yield reduction, and establishes water quality goals that are protective of the agricultural uses. The 450 mg/L water quality goal is intended to prevent reduction in crop yield, i.e. a restriction on use of water, for salt-sensitive crops. Only the most salt sensitive crops require irrigation water of 450 mg/L or less to prevent loss of yield. Most other crops can tolerate higher TDS concentrations without harm, however, as the salinity of the irrigation water increases, more crops are potentially harmed by the TDS, or extra measures must be taken by the farmer to minimize or eliminate any harmful impacts.

The average TDS effluent concentration was 634 mg/L and a ranged from 560 mg/L to 848 mg/L for 61 samples collected by the Discharger from January 2003 through May 2007. These concentrations exceed the applicable water quality objectives. The background receiving water TDS ranged from 246 mg/L to 384 mg/L, with an average of 303 mg/L in 12 sampling events performed by the Discharger from January 2002 through December 2002.

v. **Salinity Effluent Limitations.** Effluent limitations based on the MCL or the agricultural water quality goal would likely require construction and operation of a reverse osmosis treatment plant. The State Water Board, in Water Quality Order 2005-005 (for the City of Manteca), states, *"...the State Board takes official notice [pursuant to Title 23 of California Code of Regulations, Section 648.2] of the fact that operation of a large-scale reverse osmosis treatment plant would result in production of highly saline brine for which an acceptable method of disposal would have to be developed. Consequently, any decision that would require use of reverse osmosis to treat the City's municipal wastewater effluent on a large scale should involve thorough consideration of the expected environmental effects."* The State Water Board states in that Order, "*Although the ultimate solutions to southern Delta salinity problems have not yet been determined, previous actions establish that the State Board intended for permit limitations to play a limited role with respect to achieving compliance with the EC water quality objectives in the southern Delta.*" The State Water Board goes on to say, "*Construction and operation of reverse osmosis facilities to treat discharges...prior to implementation of other measures to reduce the salt load in the southern Delta, would not be a reasonable approach.*"

The Regional Water Board, with cooperation of the State Water Board, has begun the process to develop a new policy for the regulation of salinity in the Central Valley. In a statement issued at the 16 March 2006, Regional Water Board meeting, Board Member Dr. Karl Longley recommended that the Regional Water Board continue to exercise its authority to regulate discharges of salt to minimize salinity increases within the Central Valley. Dr. Longley stated, "*The process of developing new salinity control policies does not, therefore, mean that we should stop regulating salt discharges until a salinity Policy is developed. In the meantime, the Board should consider all*

possible interim approaches to continue controlling and regulating salts in a reasonable manner, and encourage all stakeholder groups that may be affected by the Regional Board's policy to actively participate in policy development."

The Antidegradation Policy (Resolution No. 68-16) requires that the Discharger implement best practicable treatment or control (BPTC) of its discharge. For salinity, the Regional Water Board is considering limiting effluent salinity of municipal wastewater treatment plants to an increment of 500 µmhos/cm over the salinity of the municipal water supply as representing BPTC, or based on the results of a site-specific receiving water study. This Order includes an interim performance-based monthly EC effluent limitation of 1,400 µmhos/cm and an interim monthly TDS mass limitation of 536,100 pounds per month, based on the existing regulated flow of 2.7 mgd, to protect the receiving water from further salinity degradation, but no final effluent limitation because sufficient site-specific information does not exist. Final effluent limitations for salinity based on BPTC, and site-specific salinity levels necessary to support beneficial uses, will be established subsequent to the collection and analysis by the Discharger of EC in the Discharger's water supply and beneficial uses of the receiving streams. This Order requires quarterly monitoring of EC and TDS of the Discharger's water supply (see Attachment E, Section IX.A).

This Order also requires the Discharger to study salinity reduction measures to reduce the salinity in its discharge to the North and South Fork of Putah Creek. Specifically, Special Provision VI.C.1.f. of this Order requires the Discharger to complete and submit a Salinity/EC – Site Specific Study and Special Provision VI.C.2.c. requires the Discharger to report on results of a site-specific investigation of appropriate EC levels to protect agricultural beneficial use in areas irrigated with water from Putah Creek diverted downstream from the discharge.

The Discharger has conducted the following studies in an effort to evaluate methods to reduce salinity in its effluent:

1. *An Approach to Develop Site-Specific Criteria for Electrical Conductivity to Protect Agricultural Beneficial Uses that Accounts for Rainfall (July 2004)* – This study identified site-specific objectives for EC that were reasonably protective of the agricultural supply beneficial uses of Putah Creek, concluding that in several short-term (5-year) runs representing relative dry and average rainfall conditions, irrigation water with an EC range of 1,100-1,200 µmhos/cm satisfied the underlying goal of not impacting crop yield. The study considered crop yield reductions of up to 10% to be insignificant, which is an inappropriate assumption for Basin Plan objectives or site-specific criteria. The study was not approved by Regional Water Board staff.

2. *Draft Salt Reduction and Source Control Alternatives Study for the UC Davis Central Heating a Cooling Plant (17 September 2004)* - The study identified four alternatives: (1) haul the brine waste to East Bay Municipal Utility District (EBMUD) for treatment, (2) replace the existing softener with a reverse osmosis system, (3) replace the existing softener with a deionizer system, and (4) re-pipe the existing softener with a lead/lag configuration to reduce the regeneration frequency in the softeners and the overall salt use. The report projected that none of these alternatives would result in an effluent that met the 900 µmhos/cm EC limit. The study concluded that hauling the salt brine would yield the highest salt reduction (12%), but it was the most expensive choice at an annual cost of $844,000.

3. *Technical Memorandum: Expanded Campus Salt Study for Salt Reduction and Source Control Evaluation (11 March 2005)* - This expanded study identified potential salt sources to evaluate, reducing the percentage of unaccounted sources from 35% to 9%. The major salt sources (Central Heating and Cooling Plant, domestic wastewater, and well water supply) for the University each contribute approximately one-quarter of the total WWTP effluent salt. The recommendation of the study was to continue monitoring salt content in the wastewater and periodic re-evaluation of the total salt from campus sources to track the effectiveness of the source control and the improvement in the WWTP EC concentration.

4. *Technical Memorandum: EC Investigation Summary (23 March 2007)* - A summary of the EC investigation initiated by the UC Davis Facility staff to identify target areas for additional study to potentially reduce salt discharges to the campus sanitary sewer system. This EC investigation collected data from sanitary sewer manholes and buildings located throughout the UC Davis campus. The study confirmed the large contributors of salt identified to be: (1) Central Heating and Cooling Plant, (2) Primate Center, (3) and Hopkins Road Pump Station.

5. *Reduction of Water Cycling in Cooling Towers* – The campus cooling towers cycle treated domestic water through their evaporative systems for cooling. With evaporation, the salt levels increase. The water is continuously blown down to the sewer to prevent excessive scaling in the towers. The systems are run to balance water use, chemical use, and scaling. The total dissolved solids (TDS) are monitored through the process control in the large cooling towers. When the TDS in the circulating water rises above the set point, more make-up water is added and the overflow drains to the sewer. The optimum set point for the cooling tower is around 3-6 cycles of concentration (i.e., the EC in the blow down is 3-6 times higher than the source water). A reduction in cycles allows for decreased EC in the discharge, but greatly increases water use and sewer flows. Potential changes to the WWTP EC levels were found to have relatively minor improvements. From a mass-balance

perspective, more salt is introduced into the environment at a slightly lower concentration by using more fresh water for dilution. The University concluded that reduction in water cycling is not a feasible solution and that switching technologies to something other than traditional cooling towers might be the solution, but a suitable technology has not been found yet.

The final conclusion of all these studies was that although some salinity reduction could be accomplished at the Heating and Cooling Plant, the largest contributor to the salinity of the wastewater discharge is the domestic water supply. The Discharger is conducting the following efforts to reduce salt in the discharge:

1. *Installation of Reverse Osmosis Units at the Central Heating and Cooling Plant* - the University is in the process of replacing existing large water softeners at the Central Heating and Cooling Plant with reverse osmosis units to pre-treat its industrial source water. This project expects to eliminate a large source of salt loading to the Facility, with effluent EC levels anticipated to drop by over 100 µmhos/cm once the new system is online by the end of 2008.

2. *Solano Project Water*- the University recently made a decision to explore options to construct a surface water treatment plant on campus and use the treated water for domestic purposes. The surface water from the Solano Project is lower in TDS and EC (an average of 204 mg/l and 315 µmhos/cm respectively) than from the deep aquifers that the University currently gets their domestic water. The University strongly supports moving this project forward, but no formal commitment has been made given that the capital cost is projected to be in the $9-11M range.

3. *Davis-Woodland Surface Water Project* - The Davis-Woodland Surface Water Project is a long-term project which is looking at obtaining surface water from the Sacramento River as a new water supply. This is a collaborative effort between the cities of Davis and Woodland and UC Davis. The University has not made a formal commitment to fund the project at this point. The addition of this new water supply would reduce EC levels at the Facility.

With the exception of augmenting its source water supply, the Discharger has exhausted source control measures and implemented best practicable treatment and control (BPTC) to improve EC in the effluent. The Discharger is currently in the process of replacing water softeners in its Central Heating and Cooling with a reverse-osmosis unit for further reduction of salinity in its wastewater.

u. **Selenium.** The NTR 4-day average (chronic) water quality criteria for the protection of aquatic life is 5 µg/L. The MEC for selenium is 6.56 µg/L based on 11 samples collected by the Discharger between March 2004 and January 2007.

Selenium concentrations in the receiving water ranged from 0.25 µg/l to 0.85 µg/L, with an average of 0.44 µg/L (based on 12 samples collected between January 2002 through December 2002). The MEC exceeds the NTR water quality objective for the protection of aquatic life. An AMEL of 3.5 µg/L and a MDEL of 9.2 µg/L have been established in the Order, pursuant to the procedures specified in the SIP (See Attachment F, Table F-8 for WQBEL calculations).

v. **Settleable Solids.** The MEC for settleable solids was less than 0.1 ml/L, based on 1,596 samples collected between January 2003 through May 2007. The previous Order required effluent limitations for settleable solids of 0.1 ml/L. The effluent has not been observed to exceed the narrative objective for settleable solids in the Basin Plan. Therefore, effluent limitations for settleable solids are no longer necessary. The removal of the effluent limitations for settleable solids is in compliance with 40 CFR 122.44(l)(2)(i)(B)(1).

w. **Toxicity.** See Section IV.C.5. of the Fact Sheet regarding whole effluent toxicity.

4. WQBEL Calculations

a. Effluent limitations for aluminum, ammonia, cyanide, and selenium were calculated in accordance with section 1.4 of the SIP. The following paragraphs describe the methodology used for calculating effluent limitations.

b. **Effluent Limitation Calculations.** In calculating maximum effluent limitations, the effluent concentration allowances were set equal to the criteria/standards/objectives.

$$ECA_{acute} = CMC \qquad ECA_{chronic} = CCC$$

For the human health, agriculture, or other long-term criterion/objective, a dilution credit can be applied. The ECA is calculated as follows:

$$ECA_{HH} = HH + D(HH - B)$$

where:

ECA_{acute} = effluent concentration allowance for acute (one-hour average) toxicity criterion

$ECA_{chronic}$ = effluent concentration allowance for chronic (four-day average) toxicity criterion

ECA_{HH} = effluent concentration allowance for human health, agriculture, or other long-term criterion/objective

CMC = criteria maximum concentration (one-hour average)

CCC = criteria continuous concentration (four-day average, unless otherwise noted)

HH = human health, agriculture, or other long-term criterion/objective

D = dilution credit

B = maximum receiving water concentration

Acute and chronic toxicity ECAs were then converted to equivalent long-term averages (LTA) using statistical multipliers and the lowest is used. Additional statistical multipliers were then used to calculate the maximum daily effluent limitation (MDEL) and the average monthly effluent limitation (AMEL).

Human health ECAs are set equal to the AMEL and a statistical multiplier is used to calculate the MDEL.

$$AMEL = mult_{AMEL}\left[\min\left(\underbrace{M_A ECA_{acute}}_{LTA_{acute}}, \underbrace{M_C ECA_{chronic}}_{LTA_{chronic}}\right)\right]$$

$$MDEL = mult_{MDEL}\left[\min\left(M_A ECA_{acute}, M_C ECA_{chronic}\right)\right]$$

$$MDEL_{HH} = \left(\frac{mult_{MDEL}}{mult_{AMEL}}\right) AMEL_{HH}$$

where: $mult_{AMEL}$ = statistical multiplier converting minimum LTA to AMEL
$mult_{MDEL}$ = statistical multiplier converting minimum LTA to MDEL
M_A = statistical multiplier converting CMC to LTA
M_C = statistical multiplier converting CCC to LTA

Water quality-based effluent limitations were calculated for aluminum, ammonia, cyanide, selenium as follows in Tables F-5 through F-8, below.

Table F-5. WQBEL Calculations for Aluminum

	Acute	Chronic
Criteria (µg/L) [1]	750	750
Dilution Credit	No Dilution	No Dilution
ECA	750	750
ECA Multiplier	0.17	0.32
LTA	127.6	236.0
AMEL Multiplier (95th%)	2.2	[2]
AMEL (µg/L)	275.8	[2]
MDEL Multiplier (99th%)	5.9	[2]
MDEL (µg/L)	750	[2]

[1] USEPA Ambient Water Quality Criteria
[2] Limitations based on acute LTA (Acute LTA < Chronic LTA)

Table F-6. WQBEL Calculations for Ammonia

	May 1 to October 31			November 1 to April 30		
	Acute	Chronic (30-day)	Chronic (4-day)	Acute	Chronic (30-day)	Chronic (4-day)
pH[2]	8.5	8.5	--	8.47	8.5	--
Temperature °C [3]	N/A	24.7	--	N/A	18.0	--
Criteria (mg/L) [1]	2.27	0.61	1.52	2.27	1.17	2.93
Dilution Credit	--	--	--	--	--	--
ECA	2.14	0.30	1.52	2.27	1.17	2.93
ECA Multiplier	0.31	0.77	0.51	0.35	0.80	0.55
LTA	0.66	0.47	0.78	0.79	0.93	1.63
AMEL Multiplier (99th%)	--	1.58	--	1.5	--	--
AMEL (mg/L)	--	**0.74**	--	**1.11**	--	--
MDEL Multiplier (99th%)	--	3.25	--	2.89	--	--
MDEL (mg/L)	--	**1.52**	--	**2.14**	--	--

(1) USEPA Ambient Water Quality Criteria
(2) Acute pH = maximum effluent or receiving stream pH, Chronic pH = permitted maximum allowed pH of 8.5
(3) Temperature = Maximum 30-day average seasonal effluent temperature

Table F-7. WQBEL Calculations for Cyanide

	Acute	Chronic
Criteria (mg/L)	22	5.2
Dilution Credit	No Dilution	No Dilution
ECA [1]	22	5.2
ECA Multiplier [2]	0.32	0.53
LTA	7.1	2.7
AMEL Multiplier [3][4]	(6)	1.55
AMEL (mg/L)	(6)	**4.3**
MDEL Multiplier[5]	(6)	3.11
MDEL (mg/L)	(6)	**8.5**

(1) ECA calculated per section 1.4.B, Step 2 of SIP. This allows for the consideration of dilution.
(2) Acute and Chronic ECA Multiplier calculated at 99th percentile per Section 1.4.B, Step 3 of SIP or section 5.4.1 and 5.5.4 of the TSD.
(3) Assumes sampling frequency n=>4.
(4) The probability basis for AMEL is 95th percentile per Section 1.4.B, Step 5 of SIP or Section 5.5.4 of the TSD.
(5) The probability basis for MDEL is 99th percentile per Section 1.4.B, Step 5 of SIP or Section 5.5.4 of the TSD.
(6) Limitations based on Chronic LTA (Chronic LTA < Acute LTA).